

## Buildings Technology Research and Development Subcommittee Meeting

May 20, 2010

Location: 950 L'Enfant Plaza DOE

Time: 1:30-3:30 p.m.

| Attendees <sup>1</sup>     | Agency/Office                  |
|----------------------------|--------------------------------|
| Shyam Sunder               | DOC/NIST BTRD Co-chair         |
| Roland Risser              | DOE/EE-Buildings BTRD Co-chair |
| Kevin Hurst                | EOP/OSTP                       |
| Paul Domich                | DOC/NIST BTRD Ex-Sec           |
| William Healy              | DOC/NIST                       |
| unidentified               | OMB                            |
| Brian Holuj                | DOE/EE-Buildings               |
| Alan Schroeder             | DOE/EE-Buildings               |
| Kurt Knight                | VA                             |
| Andrew Nichols             | PNNL                           |
| Dale Manty                 | EPA                            |
| Ken Sandler                | EPA                            |
| Diane Stewart (telephone)  | HHS                            |
| Bob Kollm                  | US Postal Service              |
| David Hawk                 | Smithsonian                    |
| Charles Iliff              | AOC                            |
| Anna Franz                 | AOC                            |
| John Taggart               | STPI                           |
| Ilker Adiguzel (telephone) | USACE                          |
| Marcus Sheffer (telephone) | Energy Opportunities, Inc      |

**Next Meeting:** July 15, 2010 1:30 - 3:30 PM, 950 L'Enfant Plaza DOE

### Meeting Calendar:

June 17, 2010 (Cancelled)

July 15, 2010

August 19, 2010

September 16, 2010

October 21, 2010

November 18, 2010

December 16, 2010

**Introductions:** Subcommittee Co-Chair Shyam Sunder (NIST) opened the monthly meeting of the Subcommittee for Buildings Technology Research and Development (BTRD) welcoming the agency representatives and thanking them for their participation. Participants provided self-introductions.

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<sup>1</sup> Active Members not attending identified in light gray

**Review of Minutes:** Minutes were reviewed prior to the start of the meeting.

**BTRD Submetering Project - Plug Loads:** Marcus Sheffer of Energy Opportunities, Inc joined the BTRD by teleconference and shared with the Subcommittee his perceptions on building energy usage focusing on plug loads. Plug loads are electrical loads from devices and appliances that connect to the electrical distribution system using standard outlets. Plug loads represent the fastest growing and least understood component to overall building energy consumption. In contrast, lighting and HVAC represent typical “process” loads and usually use dedicated power wired directly into the home distribution panel. Process load are better understood and regulated by current building codes and standards.

Due to the ambiguity in the composition and effects of plug loads, standard writing organization have not included plug loads in their energy efficiency standards (e.g., ASHRAE 90.1). Process loads regulated by ASHRAE 90.1 generally cover evaporative coolers, HVAC, lighting, electrical motors, domestic water, and other standard building systems with specific energy efficiency requirements. A methodology is available though to empirically quantifying plug loads using baseline measurements and case by case analysis.

Organizations such as USGBC are working on baseline or benchmark methodologies that can be incorporated into current scorecard systems for assessing impacts of these unregulated loads. Standard practices exist for cooking and refrigeration equipment supported in part by ancillary energy labeling systems such as EnergyStar. Additional analysis of plug loads is being performed in energy intensive applications such as data centers.

In traditional office environments, computers and peripherals, personal heaters and fans, and other comfort appliances all contribute to energy associated plug loads. These plug loads are often not measured or accurately analyzed during building design and represent volatile variables in building energy estimates. Improper analysis of plug loads may result in undersized electrical distribution systems and negatively impact overall energy efficiency measures. Analysis benchmarks for these environments often consist of kW/sqft.

The impact of plug loads on overall consumption is quite significant. For commercial buildings, plug loads are estimated at 35% of total energy use, for residential 25%, and for schools 10%. Opportunities for lowering plug loads include 1) more efficient plugged devices and appliances, 2) automated switching devices that turn off unused appliances and reduce “vampire” loads from transformers and other small but always on appliances, or 3) modifying occupant behaviors.

Brian Holuj (DOE) mentioned that DOE and NREL are, in the context of Net-Zero buildings, looking into improved operating procedures to lower plug load effects. ASHRAE is also looking into a more definitive approach to quantifying and controlling these loads.

**Action Item:** Paul Domich will contact Mark Halverson (PNNL) and Jean Boulin regarding current ASHRAE 90.1 submetering and plug load activities.

USGBC recognizes the importance of submetering and the impact of plugloads. Developers of the next generation LEED scorecard are examining how to determine savings for plug loads using a measurement and verification process. LEED for New Construction has two measurement/estimation options: IPMVP Option D - Calibrated Simulation (Savings Estimation Method 2) and **IPMVP Option B - Energy Conservation Measure Isolation using a separate meter.** Submetering for plug loads will remain optional in LEED 2012.

Implementation of appropriate metering is complicated by the electrical distribution designs and the use of multiple electrical panels containing feeds for a mixture of end-use devices and outlets. To resolve this issue, one proposal is to require that electrical distribution panels be separated by load type – an expensive proposition for the building owner.

Areas for consideration for submetering include electricity, water, steam, and NG. Submetering energy performance data is needed for each category. NREL has an ongoing study examining an advanced metering credit as a cost-effectiveness measure. DOE's Los Alamos Nat'l Lab is also examining plug loads and submetering in a hospital environment – a very energy-intensive building type. Information is sought on the modes of use and the types of loads. Additionally, for hospital environments, performance data on specialized medical equipment are not generally available. For other building types, manufacturer data on estimated energy use of their devices is generally unavailable and is needed by device type and other significant device categories.

From a federal perspective, Sheffer suggested that effective roles for federal participation include: development of energy performance data including baseline and benchmarks for different types of building systems; federal incentives to stimulate market penetration; and basic research activities supporting energy conservation by product types.

**Action Item:** Paul Domich will contact EPRI regarding recent studies related to occupant behavior and their impact on energy loads.

**BTRD Submetering Whitepaper:** The subcommittee reviewed the “Submetering Whitepaper Project Plan and Timeline” summary document. The document summarizes a project plan to develop a short 15-20 page whitepaper covering the current state of submetering, submetering gaps and challenges, and recent

applications, and literature references to relevant publications. For each section, gaps and challenges will be identified along with descriptive candidate areas where additional development or progress is required.

Sunder reviewed the proposed sections to the whitepaper and solicited volunteers from the participating agencies to contribute to the paper development. Paul Domich (annotated below as pdd) will provide supplemental text and organizational support to the whitepaper development

Outline:

- Introduction and current *State of the Art* summary (DOE/PNNL, pdd)
- Terminology and its challenges (DOE, pdd)
- Impacts of the cost of equipment and installation (NIST, STPI)
  - Cost/benefit allocation (NIST/OAE)
  - Installing submeters into existing buildings/complexes (DOE/PNNL)
  - Diverse building configurations
- How submetering affects usage (STPI)
  - How submetering data is used by owners and tenants (STPI)
  - Business case development (NIST, DOE)
  - Public disclosure strategies ()
- Submetering for electricity, water and natural gas (DOE, STPI)
  - Differences, similarities, and unique challenges
  - Integration with whole building automation systems
- Benchmarking and Analysis Tools (EPA, NIST, DOE)
  - Benchmarking (NIST/OAE, DOE)
  - Submetering analysis tools (EPA/Portfolio Manager)
  - System/equipment fault detection
  - Visualization and automation tools
- Complexity of the commercial product offerings (GSA, DOE/FEMP)
- Review of existing local / municipal mandates for submetering (STPI)
- Conclusions and final observations (pdd)

**White House Summit on Net-Zero Energy, High-Performance Green**

**Buildings:** Paul Domich provided a short overview of the current status of a spring workshop for federal high-performance green buildings organized by the Subcommittee. The date for the workshop will be June 17<sup>th</sup> and 18<sup>th</sup> (now postponed). The EOP Council on Environmental Quality has engaged in the development of the morning White House Summit session and will be working with the WH Cabinet Office in scheduling keynote and panel speakers. Participant lists will be shared with the Subcommittee co-chairs.

**Closure:** Sunder closed the meeting at 3:30 p.m. and thanked the agency representatives and guests for their participation.